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COSMIC

Monthly Report

MAY 1994

(NASA-CR-195962) COSMIC MONTHLY
PROGRESS REPORT (COSMIC) 44 p

N94-35514

Unclass

G3/61 0011873

THE UNIVERSITY OF GEORGIA

COMPUTER SOFTWARE MANAGEMENT

AND

INFORMATION CENTER

MONTHLY PROGRESS REPORT

MAY, 1994

UNDER CONTRACT

NASW-4670

PREPARED FOR

TECHNOLOGY UTILIZATION OFFICE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

WASHINGTON, D.C.

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1. GENERAL INFORMATION

Again, COSMIC experienced a low sales month in May. This was accompanied by a low software receipts month.

COSMIC exhibited at TABES 94 in Huntsville in May, and has canceled plans for further exhibits until the future funding situation is clarified.

2. INVENTORY

The current inventory of programs available from COSMIC is the sum of the Class 1 and 2 programs in TABLE 1, "Issuability Status Summary." The total number of items submitted from each source since COSMIC began is given in the right hand column of TABLE 1. Numbers listed under the "Withdrawn" column reflect those packages for which return or discard authorization has been provided by the appropriate Technology Utilization Office.

TABLE 1. ISSUABILITY STATUS SUMMARY

July 1966 to Date

<u>Center Mnemonic</u>	<u>Class 1</u>	<u>Class 2</u>	<u>Class 3</u>	<u>Class 4</u>	<u>In Process</u>	<u>With- drawn</u>	<u>Total</u>
ARC	74	5	4	4	8	87	182
COS	-	27	4	3	0	87	121
DOD	-	14	4	0	0	84	102
ERL	4	0	0	0	0	16	20
FRC	1	0	2	0	0	12	15
GSC	89	1	12	11	16	347	476
HQN	19	3	0	2	1	98	123
KSC	7	1	19	2	1	91	121
LAR	173	7	39	17	14	270	520
LEW	118	9	2	18	22	304	473
MFS	51	6	0	8	13	1,352	1,430
MSC	92	14	2	22	8	1,063	1,201
NPO	113	2	2	33	14	440	604
NUC	0	1	1	0	0	73	75
SSC	4	0	1	0	0	0	5
UGA	-	4	2	0	0	13	19
TOTALS	745	94	94	120	97	4,337	5,487

The number of submittals for the current month is below the average of the past few months. The total number of receipts for this month is six: five are initial software packages, and one is an update to a program. A summary by submittal site is shown in TABLE 2.

TABLE 2. SUMMARY OF TOTAL RECEIPTS 1994

<u>Submittal Site</u>	<u>This Month</u>	<u>Calendar Year to Date</u>
ARC	1	3
COS	0	4
DOD	0	2
ERL (SSC)	0	0
GSC	3	9
HQN	0	0
KSC	0	0
LAR	0	7
LEW	2	8
MFS	0	3
MSC	0	9
NPO	0	4
UGA	0	0
TOTAL	6	49

3. EVALUATION AND PUBLICATION

The program processing activities can be viewed as a three step process, although the steps are not necessarily done in sequence. These steps are program verification, program evaluation, and abstract preparation and publication.

Program verification represents the machine processing phase of evaluation and typically includes the compilation or assembly of supplied code using standard programming language translators followed by loading or linkage editing of the generated object code to insure completeness of the submitted code. This month COSMIC processed eleven programs through verification.

Program evaluation involves the review of programs and supporting documentation following the machine processing phase to determine their suitability for public release relative to the standards of completeness and content specified in the COSMIC Submittal Guidelines. Prices for distributed materials are also established during package evaluation. Factors considered in establishing the price charged for program code include the program source instruction counts as a gross measure of development effort, the machine independence or vintage, the quality of the supporting documentation, the known or assumed sales potential for the package, the functionality of the program relative to comparably classified packages, and the demonstrated level of developer programming support.

Seventeen programs completed the evaluation activity for the current month. Nine were class 1, one was class 2, five were class 3, and two were class 4.

TABLE 3. SUMMARY EVALUATION TOTALS January, 1994 To Date

<u>Submittal Site</u>	<u>Class 1</u>	<u>Class 2</u>	<u>Class 3</u>	<u>Class 4</u>
ARC	0	0	1	1
COS	-	1	2	3
DOD	-	2	0	0
ERL	0	0	0	0
FRC	0	0	0	0
GSC	4	0	1	0
HQN	0	0	0	1
KSC	0	0	0	0
LAR	7	0	2	0
LEW	6	0	3	0
MFS	3	0	0	0
MSC	6	0	7	0
NPO	3	0	3	0
SSC	0	0	0	0
NUC	0	0	0	0
UGA	-	0	0	0
TOTALS	29	3	19	5

Publication activities carried out by COSMIC include the preparation of descriptive abstracts for all new submittal and updated Class 1 and 2 items evaluated each month as well as the preparation of Tech Briefs for the Class 1 packages for publication in the NASA Tech Brief Journal. Nine Tech Briefs were prepared this month.

GSC-13632	-	WFI - Windowing System for Test and Simulation
LAR-15225	-	HZETRN - A Free Space Radiation Transport and Shielding Program
LEW-15874	-	COMGEN-BEM - Composite Model Generation-Boundary Element Method
LEW-15885	-	IDDS - Interactive Data Display System
LEW-16017	-	CET93/PC - Chemical Equilibrium with Transport Properties, 1993
MFS-26289	-	SDVIC - Sub-pixel Digital Video Image Correlation
MSC-22379	-	TRASYS - Thermal Radiation Analyzer System (HP9000 Series 700/800 Version without NASADIG)

- MSC-22511 - NASADIG - NASA Device Independent Graphics Library, Version 6.0 (VAX VMS Version)
- MSC-22512 - NASADIG - NASA Device Independent Graphics Library, Version 6.0 (UNIX Version)

WFI - WINDOWING SYSTEM FOR TEST AND SIMULATION

The Windowing System for Test and Simulation (WFI) is a Turbo PASCAL class library which permits data to be easily and flexibly written to screen windows. Many windowing systems require large amounts of memory and processing time for bit-mapped graphics, and have complicated applications programming interfaces. By using character-based graphics, WFI lessens the load on both the CPU and bus. The WFI application programmer's interface is simple, small, and powerful, eliminating the steep learning curve of other window programming systems. Each routine has been specifically designed to operate in real-time testing and measurement environments or as a part of a simulation process.

This package is intended to be embedded in the user's own software for application development. In many cases, functionality may be extended or modified, without changing the source code as it is written, using object oriented programming techniques.

Three window object types are derived from the base class BCEWindow: VDT, VST, and HelpWindow. The VDT (Virtual Dumb Terminal) object contains methods for simple text display, automatic logging, and scrolling. The VST (Virtual Smart Terminal) object provides a functional equivalent to the Turbo Pascal screen, with a simple user interface, cursor addressing, a variety of text colors and attributes, and logging. The HelpWindow is used for viewing text files, which are typically help files or source code. These three window types, when created, are placed on a heterogenous list called Wall. The Wall object points to a linked list of all window objects. Wall methods are defined to permit common operations to all windows with only a single user command. Operations that can be performed by Wall include

window redraws, turning logs on and off, supplying window information, and dumps to disk or printer.

WFI is written in Turbo Pascal v6.0 for IBM PC series and compatible computers running MS-DOS. Turbo Pascal v6.0 or v7.0 (Borland) is required to compile the source code. Five demonstration executables with source code are provided on the distribution medium. These executables require at least 34K of RAM and DOS 3.1 or higher. The standard distribution medium for this program is one 3.5 inch 1.44Mb MS-DOS format diskette. An electronic copy of the documentation is provided in ASCII format on the distribution medium. WFI was developed in 1993.

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HZETRN - A FREE SPACE RADIATION TRANSPORT AND SHIELDING PROGRAM

The High Charge and Energy Transport program (HZETRN) is a computationally efficient, user friendly package that addresses the problem of free space radiation transport and shielding. HZETRN is designed as a black box for design engineers who are not concerned with the physics of the underlying atomic/nuclear radiation processes in a space environment, but rather are primarily interested in obtaining fast and accurate dosimetric information for the design and construction of space modules and devices. Computational efficiency is achieved by a unique algorithm based on a deterministic approach to the solution of the Boltzmann equation rather than the computationally intensive statistical Monte Carlo method.

HZETRN is based on a space marching formulation of the Boltzmann transport equation with a straightahead approximation. Furthermore, due to the long range of the coulomb force and the large percentage of material volume being occupied by electrons, the electron interaction is treated as a continuous slowing down process. In developing the formalism, the nature of the transport coefficients (atomic and nuclear stopping power, nuclear scattering and absorption cross sections, and nuclear fragmentation cross section) had to be considered. Atomic (electronic) stopping power with energies above a few A MeV was calculated using Bethe's theory including Bragg's rule, Ziegler's shell corrections, and effective charge. At sufficiently low energies where nuclear stopping power becomes important, the nuclear stopping power theory of Lindhard, Scharff, and Schiott as modified by Ziegler was used. Nuclear absorption cross sections are obtained using fits to quantum calculations, and total cross sections are obtained with a Ramsauer formalism. Nuclear fragmentation cross sections are calculated using a semiempirical abrasion/ablation fragmentation model.

The numerical algorithm for the interpolation/extrapolation, integration, and grid generation in HZETRN controls local truncation and the propagation error. Consideration is given to minimize the number of energy grids to maintain efficiency. Since the cosmic ray fluxes are most rapidly varying at energies below 1 A GeV, a uniform logarithmic scale for the range grid is chosen from which the corresponding energy grid is calculated.

A design engineer using HZETRN can quickly obtain the integral flux, absorbed dose, or dose equivalent in tissue (water) in units of either centiGray (cGy) or centiSivert (cSv). These calculations are based on ICRP26 and ICRP60 quality factors behind various thicknesses of aluminum shield exposed to GCR at seven provided solar minima or maxima taken from 1958 to present. The flux and dosimetric results are presented for 59 individual particle field isotopes. Cumulative results are presented for six charge groups (Z being 0, 1, 2, 3-10, 11-20, and 21-28) or as total dose for the entire transported particle field at various thicknesses. Furthermore, flux and absorbed doses are calculated as a function of linear energy transfer for biological studies. Typical run time for the case of an aluminum shield of 20 grams per square centimeter and a tissue (water) target of 5 grams per square centimeter is on the order of a few minutes on a VAX 4000.

HZETRN is written in FORTRAN for DEC VAX series computers running VMS version 5.5. The RAM requirement varies with the size of the problem being solved. Documentation for HZETRN consists of six pages detailing the operation of the program, setup of input files, and how to interpret output. An electronic copy of the documentation is available in ASCII format on the distribution medium. The standard distribution medium for this package is a 1600 BPI 9-track magnetic tape in DEC VAX BACKUP format. It is also available on a TK50 tape cartridge in DEC VAX BACKUP format. HZETRN was developed in 1992.

HZETRN - A FREE SPACE RADIATION TRANSPORT AND SHIELDING PROGRAM

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COMGEN-BEM - COMPOSITE MODEL GENERATION-BOUNDARY ELEMENT METHOD

In conducting a boundary element analysis, much time and effort is spent developing the boundary element model, either manually or by use of a graphical preprocessor. COMGEN-BEM (COMposite Model GENeration- Boundary Element Method), a program developed in PATRAN Command Language (PCL), can significantly reduce the time and effort required to develop boundary element models of continuous fiber composites at the micromechanical (constituent) scale. This program generates boundary element models which are compatible with the BEST-CMS boundary element analysis code for composite micromechanical analysis.

COMGEN-BEM executes within the environment of the PATRAN graphical preprocessor. It generates boundary element models based on several user supplied parameters. Geometric data input includes model type, fiber volume fraction, fiber diameter, and model thickness. Mesh density data is entered by the user, along with material property data, fiber orientation angles, and boundary condition data. Based on the user supplied data, COMGEN-BEM executes the PATRAN model generation commands required to generate an appropriate boundary element model.

To input the required user defined data, COMGEN-BEM issues interactive prompts during program execution. The program automatically checks in most cases to ensure that a valid parameter is input, and at several points echoes input data and prompts the user to indicate whether the entered parameters are correct. Once the program completes execution, the generated model is plotted on the screen, and the user can then apply their own translator program to convert the model data into an appropriate BEST-CMS input file format.

COMGEN-BEM is written in PATRAN Command Language (PCL) for use on any computer running PATRAN v2.5. For information on obtaining PATRAN v2.5, contact PDA Engineering, PATRAN Division, 2975 Redhill Avenue, Costa Mesa, CA, 92626. This program requires 360K of RAM for execution. The documentation for COMGEN-BEM consists of NASA Technical Memorandum 105548 and an Addendum, and is available in hard copy as well as in ASCII electronic form on the distribution medium. The figures included in the NASA Technical Memorandum, however, are NOT included in the electronic format documentation. The standard distribution medium for COMGEN-BEM is a 3.5 inch diskette in UNIX tar format. Alternate distribution media and formats are available upon request. COMGEN-BEM was developed in 1993.

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IDDS - INTERACTIVE DATA DISPLAY SYSTEM

The Interactive Data Display System (IDDS) is a graphics package designed to assist in the visualization of three-dimensional flow in turbomachinery. PLOT3D format grid and simulation data files are required for input. This package is able to unwrap the volumetric data cone associated with a centrifugal compressor and display results in easy-to-understand 2D or 3D plots. IDDS provides the majority of the visualization and analysis capability for the ICE (Integrated CFD and Experiment) system. In the ICE environment, IDDS can be invoked from any subsystem, or it can be used as a stand-alone display package.

IDDS offers five different plotting styles: contour, vector, shaded, x-y, and carpet. All of these styles are available for both two-dimensional and three-dimensional data. For three-dimensional plotting, IDDS will automatically combine the i,j,k indices and predetermine views. These views are cross-channel, blade-to-blade, and meridional. The cross-channel view is formed by combining all i- and j-indices, and is intended to show secondary flow characteristics. A blade-to-blade view is developed by combining all i- and k-indices, and is intended to show streamwise flow characteristics on a plane parallel to the hub from inlet to exit. The meridional view is constructed by combining all j- and k-indices. This view is also intended to show streamwise characteristics, but in a plane parallel to a blade surface from inlet to exit.

IDDS allows the user to select up to four windows and plots to be displayed on the screen. Each window can have a unique file associated with it for plot comparison. Plot customization options include: the variable for display, slice orientation through the data, type of plot, numeric and color ranges for the color bar,

contour levels, and vector levels. Geometric coordinates are taken directly from the user-specified grid file. IDDS allows the user to display the geometry, orient it as desired, and then overlay the desired plot on top of the geometry. After selecting the desired plot(s) and geometry, the display is built. Users have the option to display the grid, the plot, or the geometry individually or in any combination. After the picture is rendered, the user can rotate, translate, or zoom on the display.

IDDS is written in C-language for Silicon Graphics IRIS and Indigo series workstations running IRIX. IDDS requires a minimum of 16Mb RAM and a display capable of 24 bit Z-buffering. A sample executable is included. The input file format used by IDDS is that of PLOT3D (COSMIC item ARC-12782). The creation of these input files is fully detailed in the documentation. The standard distribution medium for IDDS is a .25 inch IRIX compatible streaming magnetic tape cartridge in UNIX tar format. IDDS was developed in 1993.

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CET93/PC - CHEMICAL EQUILIBRIUM WITH TRANSPORT PROPERTIES, 1993

Scientists and engineers need chemical equilibrium composition data to calculate the theoretical thermodynamic properties of a chemical system. This information is essential in the design and analysis of equipment such as compressors, turbines, nozzles, engines, shock tubes, heat exchangers, and chemical processing equipment. For more than 40 years the NASA Lewis Research Center has been involved in developing methods and computer programs for calculating complex chemical equilibrium compositions and thermodynamic and transport properties of the equilibrium mixtures and for applying these properties to a number of problems. The latest version of these programs is CET93. CET93/PC is a version of CET93 which is specifically designed to run within the 640K memory limit of the MS-DOS operating system.

CET93/PC is a general program which will calculate chemical equilibrium compositions and mixture properties for any chemical system with available thermodynamic data. Generally, mixtures may include condensed and gaseous products. CET93/PC performs the following operations: 1) obtains chemical equilibrium compositions for assigned thermodynamic states, 2) calculates dilute-gas transport properties of complex chemical mixtures, 3) obtains Chapman-Jouguet detonation properties for gaseous species, 4) calculates incident and reflected shock properties in terms of assigned velocities, and 5) calculates theoretical rocket performance for both equilibrium and frozen compositions during expansion. The rocket performance function allows the option of assuming either a finite area or an infinite area combustor.

CET93/PC includes a file of thermodynamic data for over 1100 gaseous and condensed species and a file of thermal transport property data for 155 gaseous species. These data are in the form of least squares coefficients in binary form. Through use of a new "ONLY" option users may instruct CET93/PC to consider only particular species as possible products for a given equilibrium composition calculation. Relative to CET93, CET93/PC has a few limitations on array size so that it will run within the basic 640K of random access memory (RAM) available under MS-DOS. The maximum number of possible reaction species accommodated for any chemical system was reduced from 600 to 300, and the maximum number of condensed reaction species was reduced from 300 to 200. Experience has shown, however, that these limits are sufficient for most practical chemical systems.

CET93/PC is written in FORTRAN and is available only as executable code for use on IBM PC series and compatible computers running MS-DOS. The executable was created using Microsoft FORTRAN 5.1 on a 386SX PC without a math coprocessor; however, the executable will take advantage of a math coprocessor when one is present. At least 400K of RAM must be available for this executable to run properly. The distribution medium for CET93/PC includes input and output files for the example problems and two files describing how to use the program. The hardcopy documentation for CET93/PC consists of a copy of these instructions plus NASA Technical Memorandum 4557, which includes a listing of the species names of possible products. The standard distribution medium for CET93/PC is a 3.5 inch 1.44Mb MS-DOS format diskette. CET93/PC was developed in 1993.

CET93/PC - CHEMICAL EQUILIBRIUM WITH TRANSPORT PROPERTIES, 1993

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SDVIC - SUB-PIXEL DIGITAL VIDEO IMAGE CORRELATION

Sub-pixel Digital Video Image Correlation (SDVIC) is a technique to measure in-plane displacements on the surface of objects under loading, without contact. This system can be used for analyses of experimental research specimens or actual service structures of virtually any size or material. Test objects require minimal preparation and need not be isolated from vibration or temperature fluctuations. The SDVIC software produces color-graduated, full-field representations of in-plane displacements and their partial derivatives with respect to both directions. From this, linear strains, shear strains, and rotation fields may be determined.

SDVIC is based upon a computer algorithm to locate small regions of a random pattern after the pattern has been deformed. The SDVIC software determines values for in-plane displacements and strains by correlating the positions of pixel subsets in the original image to those in the deformed image based upon pixel gray levels in the digitized images. The size of subsets to be pattern matched may be customized, thus allowing many random patterns to be correlated. Several techniques, including a coarse-fine search and the Newton-Raphson method, are available for subset pattern matching. A bilinear interpolation routine provides sub-pixel resolution necessary for most displacement and strain measurements.

To utilize SDVIC, one needs a black and white video camera to acquire images of the test article before and after loading. Camera lens combinations may be altered to allow analyses of virtually any size of test article. A PC based video board is typically used to digitize these images. These images are then correlated by a PC equipped with the SDVIC software. All of the components required for a

typical system are commercially available. There is no need for custom equipment which is expensive or difficult to find.

In order to properly correlate images based upon subset gray level patterns, the test article must have a characteristic pattern on its surface. This pattern may be naturally occurring, such as the grains and grain boundaries of metals under microscopic magnification, or the pattern may be applied by dusting the specimen with fine particles or over-spraying the specimen with white and black spray paint. Pattern application typically requires only a few minutes and a few dollars for several specimens.

SDVIC is written in C-language for IBM PC series and compatible computers running MS-DOS. The minimum requirements for execution of SDVIC include an 80386 processor, Microsoft Windows v3.1, an SVGA monitor, 2Mb of RAM and 5Mb of swap space. For best results, an 80486/66MHz processor, 8Mb of RAM and 32Mb of swap space are highly recommended. SDVIC executes with Windows v3.1 in the enhanced mode. A sample executable is provided on the distribution medium. If the source code needs to be recompiled, Microsoft Software Developers Kit v3.1 and Microsoft C compiler v6.0 are required. An electronic copy of the documentation in Microsoft Word for Windows v2.0b format is included on the distribution medium. The standard distribution medium for SDVIC is a set of four 3.5 inch 1.44Mb MS-DOS format diskettes. This version of SDVIC was developed in 1993.

SDVIC - SUB-PIXEL DIGITAL VIDEO IMAGE CORRELATION

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TRASYS - THERMAL RADIATION ANALYZER SYSTEM

The Thermal Radiation Analyzer System, TRASYS, is a computer software system with generalized capability to solve the radiation related aspects of thermal analysis problems. TRASYS computes the total thermal radiation environment for a spacecraft in orbit. The software calculates internode radiation interchange data as well as incident and absorbed heat rate data originating from environmental radiant heat sources. TRASYS provides data of both types in a format directly usable by such thermal analyzer programs as SINDA/FLUINT (available from COSMIC, program number MSC-21528).

One primary feature of TRASYS is that it allows users to write their own driver programs to organize and direct the preprocessor and processor library routines in solving specific thermal radiation problems. The preprocessor first reads and converts the user's geometry input data into the form used by the processor library routines. Then, the preprocessor accepts the user's driving logic, written in the TRASYS modified FORTRAN language. In many cases, the user has a choice of routines to solve a given problem. Users may also provide their own routines where desirable. In particular, the user may write output routines to provide for an interface between TRASYS and any thermal analyzer program using the R-C network concept.

Input to the TRASYS program consists of Options and Edit data, Model data, and Logic Flow and Operations data. Options and Edit data provide for basic program control and user edit capability. The Model data describe the problem in terms of geometry and other properties. This information includes surface geometry data,

documentation data, nodal data, block coordinate system data, form factor data, and flux data. Logic Flow and Operations data house the user's driver logic, including the sequence of subroutine calls and the subroutine library. Output from TRASYS consists of two basic types of data: internode radiation interchange data, and incident and absorbed heat rate data. The flexible structure of TRASYS allows considerable freedom in the definition and choice of solution method for a thermal radiation problem. The program's flexible structure has also allowed TRASYS to retain the same basic input structure as the authors update it in order to keep up with changing requirements.

Among its other important features are the following: 1) up to 4000 node problem size capability (3200 under VAX/VMS) with shadowing by intervening opaque or semi-transparent surfaces; 2) choice of diffuse, specular, or diffuse/specular radiant interchange solutions; 3) a restart capability that minimizes recomputing; 4) macroinstructions that automatically provide the executive logic for orbit generation that optimizes the use of previously completed computations; 5) a time variable geometry package that provides automatic pointing of the various parts of an articulated spacecraft and an automatic look-back feature that eliminates redundant form factor calculations; 6) capability to specify submodel names to identify sets of surfaces or components as an entity; and 7) subroutines to perform functions which save and recall the internodal and/or space form factors in subsequent steps for nodes with fixed geometry during a variable geometry run.

There are three machine versions of TRASYS v27: a DEC VAX version, a Cray UNICOS version and a HP9000 Series 700/800 version. All three versions require the installation of NASADIG 5.7, which is available from COSMIC bundled with TRASYS. The NASADIG 5.7 (NASA Device Independent Graphics Library, v5.7) plot package pro-

vides a pictorial representation of input geometry, orbital/orientation parameters, and heating rate output as a function of time. NASADIG 5.7 supports Tektronix terminals. Please note: TRASYS v27 is not compatible with NASADIG 6.0.

The CRAY version of TRASYS v27 is written in FORTRAN 77 for batch or interactive execution and has been implemented on CRAY X-MP and CRAY Y-MP series computers running UNICOS. The standard distribution medium for MSC-21959 (CRAY version without NASADIG 5.7) is a 1600 BPI 9-track magnetic tape in UNIX tar format. The standard distribution medium for COS-10040 (CRAY version with NASADIG 5.7) is a set of two 6250 BPI 9-track magnetic tapes in UNIX tar format. Alternate distribution media and formats are available upon request.

The DEC VAX version of TRASYS v27 is written in FORTRAN 77 for batch execution (only the plotting driver program is interactive) and has been implemented on a DEC VAX 8650 computer under VMS. Since the source codes for MSC-21030 and COS-10026 are in VAX/VMS text library files and DEC Command Language files, COSMIC will only provide these programs in the following formats: MSC-21030, TRASYS (DEC VAX version without NASADIG 5.7) is available on a 1600 BPI 9-track magnetic tape in VAX BACKUP format (standard distribution medium) or in VAX BACKUP format on a TK50 tape cartridge; COS-10026, TRASYS (DEC VAX version with NASADIG 5.7), is available in VAX BACKUP format on a set of three 6250 BPI 9-track magnetic tapes (standard distribution medium) or a set of three TK50 tape cartridges in VAX BACKUP format.

The HP9000 version of TRASYS is written in FORTRAN 77 for implementation on HP9000 Series 700/800 computers running HP-UX v8.07, or higher. The standard distribution medium for either MSC-22379 (HP9000 version without NASADIG 5.7) or COS-10053 (HP9000 version with NASADIG 5.7) is a 4mm DAT tape cartridge in UNIX tar format. Alternate distribution media and formats are available upon request. Although the modifications required to port TRASYS v27 to HP-UX should make this

machine version of TRASYS v27 the easiest version to port to other UNIX type computers, there are still a number of non-trivial modifications which would have to be made. Those interested in porting TRASYS v27 to other UNIX platforms should keep in mind that, unfortunately, neither the program author or COSMIC will be able to provide support or assistance for porting efforts. TRASYS was last updated in 1993.

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NASADIG - NASA DEVICE INDEPENDENT GRAPHICS LIBRARY, VERSION 6.0

The NASA Device Independent Graphics Library, NASADIG, can be used with many computer-based engineering and management applications. The library gives the user the opportunity to translate data into effective graphic displays for presentation. The software offers many features which allow the user flexibility in creating graphics. These include two-dimensional plots, subplot projections in 3D-space, surface contour line plots, and surface contour color-shaded plots. Routines for three-dimensional plotting, wireframe surface plots, surface plots with hidden line removal, and surface contour line plots are provided. Other features include polar and spherical coordinate plotting, world map plotting utilizing either cylindrical equidistant or Lambert equal area projection, plot translation, plot rotation, plot blowup, splines and polynomial interpolation, area blanking control, multiple log/linear axes, legends and text control, curve thickness control, and multiple text fonts (18 regular, 4 bold).

Subprograms in NASADIG have been segregated into two libraries, a System Interface Library (SYSLIB) and a Graphics Library (GRAFLIB). The SYSLIB library allows a programmer's application to perform host system interface and primitive data type operations while retaining portability among the different host platforms on which NASADIG is supported. All source code deviations from the ANSI FORTRAN standard are isolated in these host system configurable SYSLIB subprograms. SYSLIB achieves application program host independence by configuring system dependent code in the SYSLIB installation scripts, and by adoption of a long-term policy of conformance with the POSIX standard. SYSLIB is used extensively by GRAFLIB, and is primarily responsible for the host system independence of the GRAFLIB package.

NASADIG's GRAFLIB contains several groups of subroutines. Included are subroutines for plot area and axis definition; text set-up and display; area blanking; line style set-up, interpolation and plotting; color shading and pattern control; legend, text block, and character control; device initialization; mixed alphabets setting; and other useful functions.

NASADIG provides the following output device drivers: Vector Save, PostScript files, Tektronix 40xx, 41xx, and 4510 Rasterizer, DEC VT-240 (4014 mode), IBM PC/AT compatible with SmartTerm 240 emulator, JSC Film Recorder Lab, QMS 800/1200 and DEC LN03+ Laserprinters.

NASADIG 6.0 is written in FORTRAN 77 in strict conformance with the ANSI X3.9-1978 FORTRAN standard. COSMIC offers two versions of NASADIG 6.0, one for DEC VAX series computers running VMS 5.0 or later (MSC-22511), and one for computers running UNIX-based operating systems (MSC-22512). The DEC VAX VMS version has also been tested on a DEC ALPHA AXP computer running OpenVMS AXP 1.5. COSMIC has successfully implemented the UNIX version on Sun4 series computers running SunOS, SGI IRIS computers running IRIX, Hewlett Packard 9000 computers running HP-UX, and CRAY Y-MP series computers running UNICOS. The authors have also tested the UNIX version on Convex computers running Convex OS, Amdahl series computers running UTS, DEC Alpha AXP series computers running OSF1, and Apollo series computers running Domain/OS VSR10.4. A minimum of 225Mb of disk space is required to install NASADIG. NASADIG is distributed in source code format, and an X3.9-1978 compliant FORTRAN compiler is required for installation on any supported host.

Please note: In order for NASADIG 6.0 to operate with strict ANSI X3.9-1978 FORTRAN compilers, it was necessary to substitute the character data type for integer arrays that had previously stored text (Hollerith) data. As a result, some GRAFLIB v6.0 subprograms that were a part of NASADIG 5.7 have slightly different

argument lists and/or calling conventions than they did in NASADIG 5.7. NASADIG 5.7 compatible user application programs which utilized these subprograms may require modification before they can be used with NASADIG 6.0. Instructions for modifying user application programs that utilized these subprograms are included in the GRAFLIB User's Manual.

The standard distribution medium for MSC-22511 is a set of two 6250 BPI 9-track magnetic tapes in DEC VAX BACKUP format. It is also available on a set of two TK50 tape cartridges in DEC VAX BACKUP format. The standard distribution medium for MSC-22512 is a .25 inch streaming magnetic tape cartridge (Sun QIC-150) in UNIX tar format. Alternate distribution media and formats are available upon request. The distribution medium includes code to generate the documentation in POSTSCRIPT format.

SUBMITTED BY -

R.T. ANDERSON
R.N. LUTOWSKI
GRUMMAN TECHNICAL SERVICES

INQUIRIES CONCERNING THIS PROGRAM SHOULD BE ADDRESSED TO -

COSMIC
THE UNIVERSITY OF GEORGIA
382 EAST BROAD STREET
ATHENS, GA, 30602

06/01/94

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4. MARKETING

The marketing activities performed by COSMIC involve: promotion of COSMIC and computer programs available from COSMIC in the technical press and trade journals; attendance at trade shows and professional society meetings to promote the services and software available from COSMIC; utilization of various media for the general promotion of COSMIC; utilization of benefits analysis reports to highlight COSMIC's technology transfer function; and preparation of abstract collections and program summaries.

In May, COSMIC exhibited at the Technology and Business Exposition and Symposium, TABES in Huntsville, Alabama. This exhibition showcases a number of technology based businesses in the Huntsville area.

COSMIC plans no further exhibits until the decision is made concerning the future of COSMIC.

5. CUSTOMER SERVICE

Customer Service provided by COSMIC, in addition to the distribution of program code and documentation, includes responding to requests for information. These requests may be in the form of telephone calls, letters, Tech Briefs cards, mini-brochure cards, trade show return cards, or magazine inquiry cards. Generally the requested information concerns the services provided by COSMIC, or information on specific programs or groups of programs which may be available from COSMIC. This month, a total of 1421 information requests were processed. This was divided into 1378 domestic requests and 43 international requests. Of the domestic requests, 452 were responses to Tech Briefs and 15 were responses to press releases and paid ads, and 115 free catalogs were sent to card deck announcements (paid) and trade show visitors. In addition to the above, E-Mail new program announcements were sent to 2380 domestic E-Mail subscribers, and there were 418 sessions on the COSLINE information system, 3485 sessions from 755 unique machines on Worldwide Web, and 7308 sessions from 2187 machines on Gopher and 207 sessions on WAIS.

One other area of customer service is the response to requests for information relevant to problems associated with a particular program product installation. These requests are usually handled jointly with the Technical Service staff. After the customer problems have been resolved, a Problem Report Sheet is processed and added to the program package file for future reference. No problem reports were processed this month.

During the current month, a total of 83 customers representing 77 organizations received materials (program, documentation, or catalogs) from COSMIC. Customers represent individuals, whereas, organizations represent corporations or institutions. These customers are located in 16 different states or territories. Both NASA and non-NASA disseminations are reflected in these statistics.

6. BENEFITS IDENTIFICATION

COSMIC follows an active campaign of interviewing previous customers in order to ascertain the utility of distributed programs and identify specific benefits accruing to users of these programs. Additionally, contact with customers is used to evaluate the services provided by COSMIC. When notable benefits are identified, they are documented in reports written by COSMIC staff which are then approved for public release by the customers. No benefits report was released for publication this month.

7. MAINTENANCE AND SUPPORT

MAY PROGRESS REPORT FOR NASTRAN MAINTENANCE

RPK's primary goal for May was to deliver the 1994 release for the VAX VMS, VAX ULTRIX, and Generic UNIX versions. These goals were accomplished. The following is an itemization of the work accomplished during the month of May:

1. The supplemental documentation for the VAX VMS, DEC ULTRIX, and Generic UNIX platforms was updated for the 1994 Release and delivered to COSMIC.
2. Created the 1994 HP Release supplemental documentation.
3. Updated the NASINFO file with the 1994 release information.
4. Updated the User's Manual text files and WordPerfect files for the new DMAP commands "INSERT" and "DELETE."
5. Delivered the 1994 VAX VMS Release to COSMIC.
6. Delivered the 1994 DEC ULTRIX Release to COSMIC.
7. Delivered the 1994 Generic UNIX Release to COSMIC.
8. Delivered the 1994 HP Release to COSMIC.
9. The following letter was sent during the month of May:
 - a. Kyle Martini - documenting support help provided and a reported problem (SPR 94-002)
10. Began work on creating the 1994 IBM MVS Release.
11. Corrected SPR 94-002 involving the use of the CTRAPAX element and the damping coefficient on the MAT1 card.

12. Completed SPR 93-033 that requested that the ANISOP DMAP statement be added to all Rigid Formats.
13. Support was given to NASTRAN users as follows:
 - a. Provided information to seven (7) potential lessees.
 - b. Aided seven (7) lessees with problems that did not result in an SPR.

The following tasks are defined for the month of June:

1. Create and deliver the 1994 release for the IBM MVS and SGI platform.
2. Begin work on the DEC ALPHA OPEN VMS release.
3. Continue to work on active SPRs.
4. Respond to users who call with problems.

If there are any questions, please call.

TABLE 4 TOTAL DISSEMINATIONS

ITEM	Current Month		Dec. 1, 1991 To Date	
	VOLUME	VALUE	VOLUME	VALUE
A. ITEMS INVOICED				
1. Programs	47	30,654.00	1836	1,158,386.50
2. Documentation	65	3,786.00	3086	206,846.00
3. Leases (Initial)	1	550.00	506	517,249.00
4. Leases (Renewals)	7	20,550.00	205	754,583.32
5. Leases (Misc.)	0	0	0	0
6. Catalogs	2	30.00	1247	37,373.00
7. Miscellaneous	12	1,123.25	680	89,985.02
<hr/>				
<u>TOTAL INVOICE</u>		\$56,693.25		\$2,764,422.84
 B. NASA (No Charge)				
1. Programs	12	13,400.00	861	917,674.00
2. Documentation	12	895.00	976	52,568.00
3. Leases (Initial)	0	0	205	419,000.00
4. Leases (Renewals)	1	10,000.00	110	470,000.00
5. Leases (Misc.)	0	0	0	0
6. Catalogs	0	0	1128	28,665.00
7. Miscellaneous	1	100.00	22	2,870.00
<hr/>				
<u>TOTAL NASA</u>		\$24,395.00		\$1,890,777.00
 C. OTHER (No Charge)				
1. Programs	1	350.00	125	135,075.00
2. Documentation	0	0	49	2,773.00
3. Leases	0	0	13	46,200.00
4. Catalogs	0	0	100	2,540.00
5. Miscellaneous	0	0	4	400.00
<hr/>				
<u>TOTAL OTHER</u>		\$350.00		\$186,988.00
<hr/>				
<u>GRAND TOTAL DISSEMINATION</u>		\$81,438.25		\$4,842,187.84

TABLE 5 NASTRAN DISSEMINATIONS

ITEM	Current Month		Dec. 1, 1991 To Date	
	VOLUME	VALUE	VOLUME	VALUE
A. ITEMS INVOICED				
1. Licenses Initial	0	0	9	30,300.00
2. Licenses Renewals	1	2,000.00	139	440,808.34
3. Licenses (Misc.)	0	0	0	0
4. Documentation	6	220.00	136	7,080.00
5. Miscellaneous	0	0	12	6,672.24
<hr/>				
<u>TOTAL NASTRAN INVOICED</u>		\$2,220.00		\$484,860.58
B. NASA (No Charge)				
1. Licenses Initial	0	0	9	42,500.00
2. Licenses Renewals	0	0	72	280,000.00
3. Licenses (Misc.)	0	0	0	0
4. Documentation	0	0	39	2,540.00
5. Miscellaneous	0	0	0	0
<hr/>				
<u>TOTAL NASA NASTRAN</u>		\$0.00		\$325,040.00
<u>GRAND TOTAL NASTRAN</u>		\$2,220.00		\$809,900.58

TABLE 6 DOD DISSEMINATIONS

ITEM	Current Month		Dec. 1, 1991 To Date	
	VOLUME	VALUE	VOLUME	VALUE
A. ITEMS INVOICED				
1. Programs	0	0	11	19,300.00
2. Documentation	0	0	29	1,143.00
3. Leases	0	0	13	2,600.00
<hr/>				
<u>TOTAL DOD</u>		\$0.00		\$23,043.00

TABLE 7 FOREIGN DISSEMINATIONS

ITEM	Current Month		Dec. 1, 1991 To Date	
	VOLUME	VALUE	VOLUME	VALUE
A. ITEMS INVOICED				
1. Programs	8	10,500.00	343	460,150.00
2. Documentation	7	1,064.00	492	64,171.00
3. Leases (Initial)	0	0	46	139,850.00
4. Leases (Renewals)	1	8,000.00	33	183,849.98
5. Leases (Misc.)	0	0	0	0
6. Catalogs	0	0	130	7,460.00
7. Miscellaneous	1	200.00	115	25,380.65
<hr/>				
<u>TOTAL FOREIGN</u>		\$19,764.00		\$880,861.63

FINANCIAL STATUS

NASW 4670

MAY 1994

	CURRENT MONTH	CONTRACT TO DATE
Expense:		
Personnel	41,154.46	1,335,956.03
Staff Benefits	12,264.77	377,867.09
Travel	2,483.67	72,564.99
Equipment Purchases	0	27,613.95
Computer Time	259.17	11,084.51
Operating Expense	9,895.17	699,807.39
Program Maintenance	91,715.53	938,310.71
Overhead	15,497.64	609,867.47
 Total Expense	 173,270.41	 4,073,072.14
 Income:		
Sales Income	49,217.75	2,567,086.49
NASA Payments	31,208.33	1,655,290.98
 Total Income	 80,426.08	 4,222,377.47
 FINANCIAL STATUS:		
Income - Expense	(92,844.33)	149,305.33

